

CLAIMS

1. A method for managing congestion of traffic at a plurality of ports of a switch system, the switch system having at least a scheduler, said method comprising:

(a) monitoring outgoing traffic at the ports of the switch to identify traffic conditions at each of the ports;

(b) notifying the scheduler of the switch system of the traffic conditions; and

(c) scheduling of traffic to the ports by the scheduler based in part on the traffic conditions provided to the scheduler by said notifying (b).

2. A method as recited in claim 1, wherein said monitoring (a) operates to independently monitor the outgoing traffic queued for each of the ports to identify the traffic conditions at each of the ports.

3. A method as recited in claim 2, wherein said scheduling (c) by the scheduler operates to independently adjust the rate of traffic delivery to each of the ports based on the respective traffic conditions at the ports.

4. A method as recited in claim 1, wherein the switch system includes at least one queue for each of the ports, and

wherein said monitoring (a) of the outgoing traffic operates to monitor an amount of the outgoing traffic stored in each of the queues.

5. A method as recited in claim 1, wherein said notifying (b) comprises:

(b1) forming a flow control packet including an indication of the traffic conditions at one or more of the ports; and

(b2) sending the flow control packet to the scheduler.

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6. A method as recited in claim 1, wherein said scheduling (c) by the scheduler operates to independently adjust the rate of traffic delivery to each of the ports.

10 7. A method for applying flow control to a multi-port switch system having at least a scheduler, said method comprising:

detecting congestion at a particular port of the multi-port switch system;

notifying the scheduler of the detected congestion; and

15 restricting granting of requests to send additional data to the particular port of the multi-port switch system to ameliorate the detected congestion at the particular port.

8. A method for managing congestion of traffic at a plurality of ports of a switch system, the switch system having at least a scheduler, said method comprising:

monitoring outgoing traffic at the ports of the switch to identify traffic conditions at each of the ports;

20 determining whether flow control is desired based on the traffic conditions;

notifying the scheduler of the switch system of the traffic conditions when said determining determines that flow control is desired; and

altering scheduling of traffic to the ports based on the traffic conditions provided to the scheduler by said notifying.

9. A method as recited in claim 8, wherein said determining operates to
5 compare the traffic conditions to a threshold value.

10. A method as recited in claim 8, wherein the traffic conditions indicate whether congestion is present.

10 11. A method as recited in claim 8, wherein the traffic conditions indicate a degree of congestion.

12. A method as recited in claim 8, wherein the traffic conditions further indicate a flow reduction value.

15 13. A method for managing congestion of traffic at a plurality of ports of a switch system, the switch system having at least a scheduler, said method comprising:

20 monitoring outgoing traffic at the ports of the switch to identify traffic conditions at each of the ports;

producing flow control information for each of the ports based on the traffic conditions at each of the ports; and

altering scheduling of traffic to the ports based on the flow control information.

25 14. A method as recited in claim 13, wherein said altering is performed on a per port basis.

15. A method as recited in claim 13, wherein said method further comprises:

providing the scheduler of the switch system with the flow control information.

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16. A method as recited in claim 15, wherein said providing comprises:

forming a flow control cell based on or including the flow control information; and

transmitting the flow control cell to the scheduler.

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17. A method as recited in claim 15, wherein the scheduler comprises a flow control manager.

18. A method as recited in claim 13, wherein the switch system further includes at least a flow control manager.

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19. A method as recited in claim 18, wherein said method further comprises:

providing the flow control manager of the switch system with the flow control information.

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20. A method as recited in claim 19, wherein said providing comprises:

forming a flow control cell based on or including the flow control information; and

transmitting the flow control cell to the flow control manager.

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21. A method as recited in claim 13,

wherein said altering is performed on a per port basis, and

wherein the scheduler is operatively connected to a flow control manager, the flow control manager interacts with the scheduler to alter the scheduling of traffic to the ports in accordance with the flow control information.

22. A method as recited in claim 13, wherein the flow control information comprises flow control amounts for at least a plurality of the ports.

23. A switch system, comprising:

a switch unit that switches data through said switch system;

a scheduler that receives requests to transfer blocks of data through said switch system and selectively concurrently permits one or more of the requests to transfer blocks of data through said switch unit; and

a flow control manager that receives flow control information and alters the amount of or rate that requests to transfer blocks of data through said switch unit are permitted by said scheduler based on the flow control information.

24. A switch system as recited in claim 23, wherein said switch system supports a plurality of ports, and

wherein the flow control information is derived from congestion information that indicates presence or absence of congestion at one or more of the ports.

25. A switch system as recited in claim 23, wherein said switch system supports a plurality of ports,

wherein said switch system further comprises at least one receive-side queue and at least one transmit-side queue for each of the ports, and

wherein the flow control information is dependent upon an amount or rate of congestion at said receive-side queue.

26. A switch system as recited in claim 25, wherein said switch system further comprises:

a traffic manager operatively connected to at least said receive-side queue, said traffic manager monitors said receive-side queue and produces the flow control information that is supplied to said flow control manager.

27. A switch system as recited in claim 23, wherein said switch system supports a plurality of ports,

wherein said switch system further comprises at least one receive-side queue and at least one transmit-side queue for each of the ports, and

wherein said flow control manager receives the flow control information associated with said receive-side queue and subsequently alters the amount of or rate that requests to transfer blocks of data through said switch unit to said receive-side queue are permitted by said scheduler.

28. A switch system as recited in claim 27, wherein said flow control manager does not alter the amount of or rate that requests to transfer blocks of data through said switch unit to said transmit-side queue are permitted by said scheduler.

29. A switch system, comprising:

a switch unit that switches data through said switch system; and

a scheduler that receives requests to transfer blocks of data through

- 5 said switch system, receives flow or traffic information, and selectively concurrently permits one or more of the requests to transfer blocks of data through said switch unit in accordance with the flow or traffic information such that the amount of or rate that requests to transfer blocks of data through said switch unit are altered dependent on the flow or traffic
- 10 information.